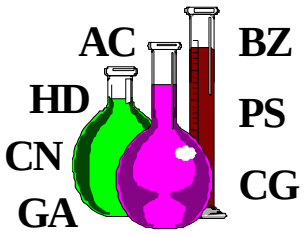
U.S. Army Center for Health Promotion and Preventive Medicine

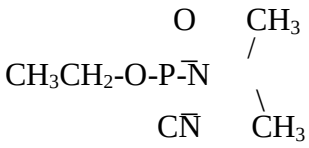


Detailed Facts About Nerve Agent GA

218-02-1096

Physical Properties of Nerve Agent GA

Chemical Structure



Chemical Formula $C_5\ H_{11}\ N_2\ 0_2\ P$

Description G-type nerve agents are clear, colorless, and tasteless liquids, chemically similar to organophosphate pesticides such as Malathion or Parathion. GA has a slightly fruity odor.

Molecular weight 162.3

Boiling Point 247.5°C

Vapor Pressure (mm Hg) 0.07 @ 24°C

Freezing Point -50°C

Density Liquid = 1.07 - Liquid
Vapor = 5.6 (air = 1)

Solubility Miscible

Flash Point 78°C

Agent GA - The chemical dimethylphosphoramido-cyanidate, Chemical Abstract Service Registry No. 77-81-6.

Volatility	90 mg/m^3 @ 0°C 610 mg/m^3 @ 25°C 858 mg/m^3 @ 30°C	
Toxicity Values	LCt_{50} (inhalation, 0.5 to 2 min.)	= 135 mg-min/m^3 @ respiratory minute volume (RMV) of 15 l/min = 200 mg-min/m^3 @ RMV of 10 l/min
	LD_{50} (skin)	= 14 to 15 mg/kg

Exposure Limits

Workplace Time-Weighted Average -	0.0001 mg/m^3
General Population Limits -	0.000003 mg/m^3

Toxic Properties of Nerve Agent GA

GA-type nerve agents stored in the unitary stockpile are in ton containers, artillery shells, mortar projectiles, rockets, and land mines.

G-type nerve agents are considered to be nonpersistent chemical agents that may present a significant vapor hazard to the respiratory tract, eyes, or skin. GA-type nerve agents affect the body by blocking the action of the enzyme acetylcholinesterase. When this enzyme is blocked, large amounts of the chemical acetycholine build up at critical places within the nervous system, causing hyperactivity of the muscles and body organs stimulated by these nerves. The signs and symptoms of exposure to GA-type nerve agents depend upon the *route of exposure* and the *amount of exposure.*

Overexposure Effects

Signs and symptoms are the same regardless of route the poison enters the body (by inhalation, absorption, or ingestion): runny nose; tightness of chest; dimness of vision and miosis (pinpointing of the eye pupils); difficulty in breathing; drooling and excessive sweating; nausea; vomiting; cramps, and involuntary defecation and urination; twitching, jerking, and staggering; and headache, confusion, drowsiness, coma, and convulsion. These signs and symptoms are followed by cessation of breathing and death.

Emergency and First Aid Procedures

Inhalation: hold breath and don respiratory protection mask; if severe signs of agent exposure appear, administer <u>immediately</u>, in rapid succession, all three Nerve Agent Antidote Kits, Mark I injectors; use mouth-to-mouth resuscitation when approved mask-bag or oxygen delivery systems are not available; do not use mouth-to-mouth resuscitation when facial contamination exists; administer oxygen if breathing is difficult; seek medical attention <u>immediately</u>.
Eye Contact: flush eyes <u>immediately</u> with water for 10-15 minutes then don a respiratory

protective mask. Although miosis may be an early sign of agent exposure, do not administer an injection when miosis is the only sign present; seek medical attention immediately.

Skin Contact: don respiratory mask and remove contaminated clothing; wash contaminated skin with copious amounts of soap and water immediately using 10 percent sodium carbonate solution, or 5 percent liquid household bleach; rinse well with water to remove decontamination; if local sweating and muscular symptoms occur, administer an intramuscular injection with the MARK I Kit; seek medical attention immediately.

Ingestion: do not induce vomiting; first symptoms are likely to be gastrointestinal; administer immediately 2 milligrams (mg) intramuscular injection of the MARK I kit auto injectors; seek medical attention immediately.

Protective Equipment

Protective Gloves:	Wear Butyl Glove M3 and M4 Norton, Chemical Protective Glove Set.
Eye Protection:	Wear chemical goggles; use goggles and faceshield for splash hazards.
Other:	Wear gloves and lab coat with M9 or M14 mask readily available for general lab work.

Reactivity Data

Stability:	Stable, ~24 hours
Incompatibility:	Not available
Hazardous Decomposition:	Decomposes within 6 months at 60°C; complete decomposition in 3 1/4 hours at 150°C; may produce HCN; oxides of nitrogen, oxides of phosphorus, carbon monoxide, and hydrogen cyanide.
Persistency	The persistency will depend upon munitions used and the weather. Heavily splashed liquid persists 1 to 2 days under average weather condition.

References

1. Department of the Army Pamphlet (DA PAM) 40-8, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, BD, and VX*, December 1990.

2. Department of the Army Field Manual (DA FM) 3-9, *Potential Military Chemical/Biological Agents and Compounds*, 1990.

3. Army Regulation (AR) 385-61, *The Army Toxic Chemical Agent Safety Program,* July 1983.

4. U.S. Army Chemical Command Materiel Destruction Agency, *Site Monitoring Concept Study*, 15 September 1993.

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